Airport Paving

Nova Scotia Asphalt User Producer Group

Annual Seminar April 12th, 2012

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Outline

- Background – What's different About Airports/ Runways?
- Airport Specifications
- Joint Construction Options
- CFB Shearwater Heliport Conversion
- HIAA Specification Changes

Airport Paving

How's it's different from Highway or Street Paving

About the roads we love to PAVE

- Typically Long/Straight
- Changing gradients, curves and slopes to accommodate efficient construction.
- Traffic runs in wheel paths – Loads are restricted by governments to preserve infrastructure.
- Joints are constructed out of wheelpaths
- Built on a gradient to shed water and protect public travelling at high speeds.

Airport Paving

How's it's different from Highway or Street Paving

What About Runways then?

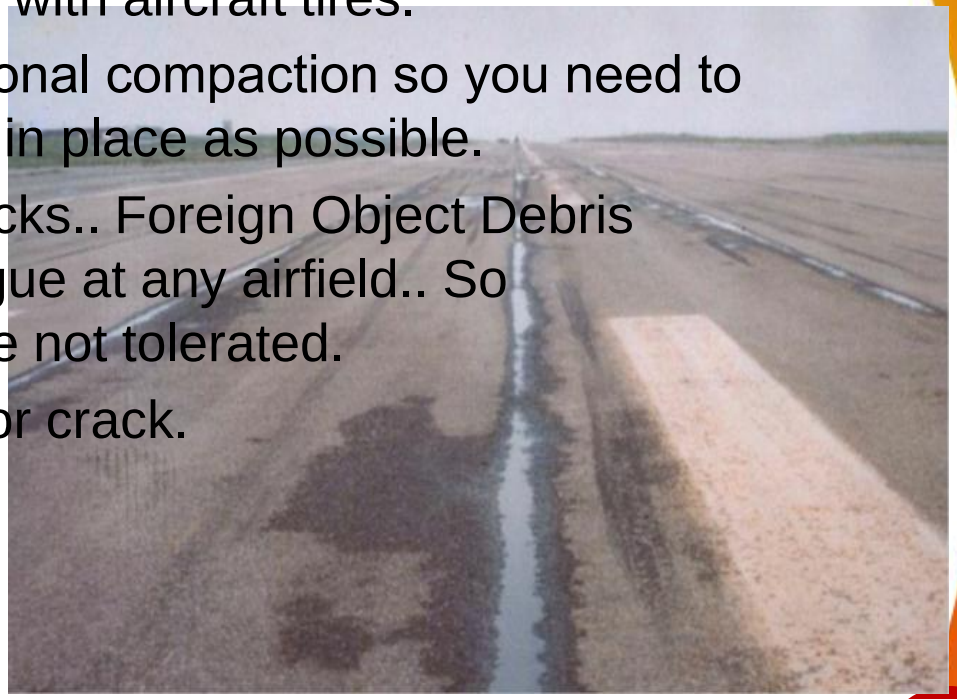
- They are wide and flat, so airplanes can land, with many potential joints
- No Traffic
- Heavy Loads.

Airport Paving

How's it's different from Highway or Street Paving

Things To Consider

- Water must absolutely drain. If you think cars are bad hydroplaning you should try it with aircraft tires.
- There's no traffic to get additional compaction so you need to achieve as close to 4% voids in place as possible.
- Turbine engines to not like rocks.. Foreign Object Debris (FOD) is avoided like the plague at any airfield.. So pavements that ravel at all are not tolerated.
- Likewise, joints cannot ravel or crack.



How Do Specifications Differ?

Materials Design

Asphalt Mix Design

- Asphalt that has a closed surface texture to prevent raveling, and improve density
- Gradations are typically finer, and use less compactive effort in the design to force more liquid asphalt in the mix, helping compaction in the field.
- Transport Canada Guidelines are historically 50 Blow Marshall mixes, with very high natural sand contents.

How Do Specifications Differ?

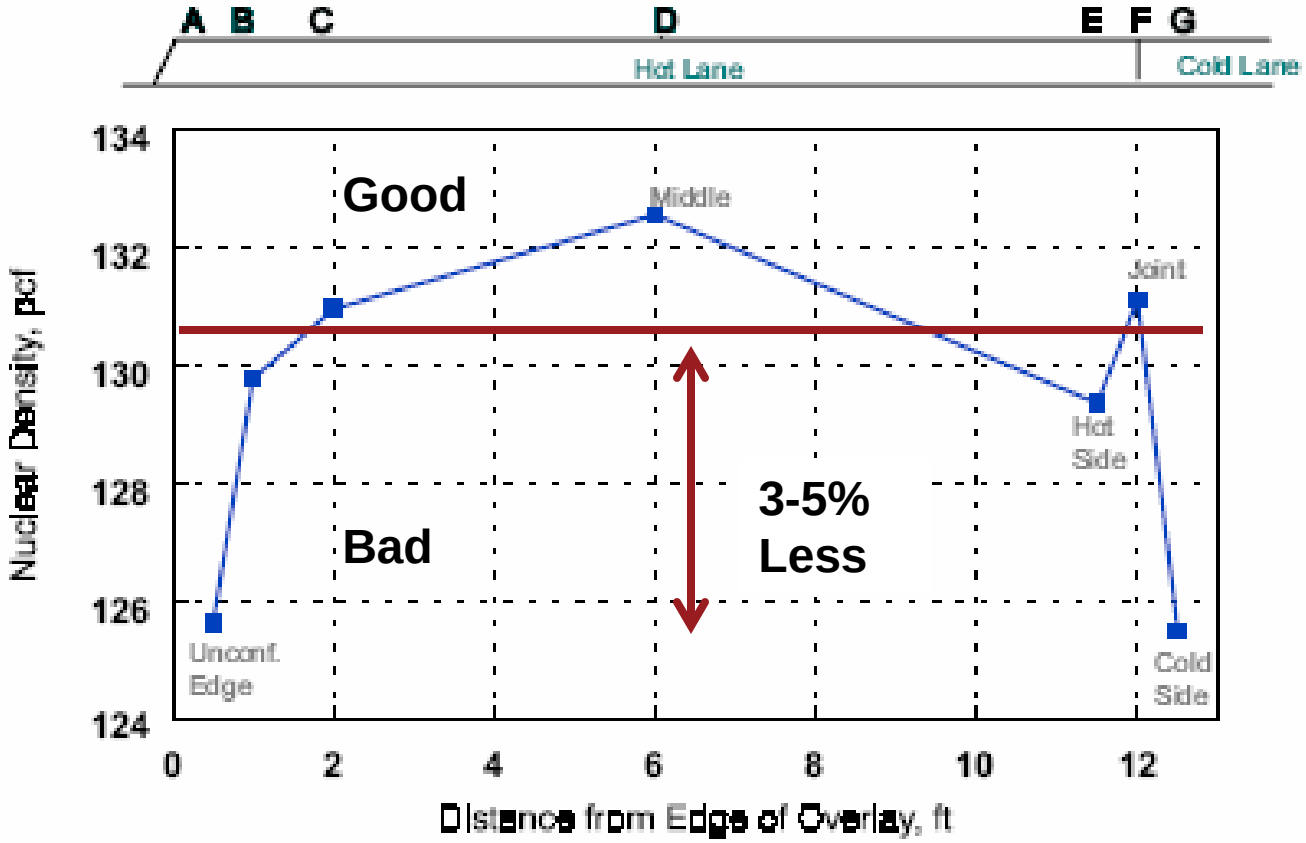
Construction

Density & Smoothness Requirements

- Density Requirements are higher, typically 94% of Maximum Density (compared to 92.5% for typical Highway Mixes)
- Runways Typically have a joint density Specification, typically 92% of Max density (2% decrease from main mat) to try and help with long term joint performance.
- Typically 3mm / 3m straightedge tolerance for surface asphalt and within 3m of design grade at all locations.
- Contractors are now using automated GPS or survey Controlled systems to ensure grades. (Topcon/Pavesmart)

A Little About Density

Typical Mat density Profile



Ref: Texas Transportation Institute

Joints, Joints, Joints

- Joint are more permeable
- Deform rather than compact
- Subject to freeze/thaw

- Joint failure is the most common and most expensive pavement failure for airport pavements, and therefore most focused on construction item.

How Do Specifications Differ?

Joints

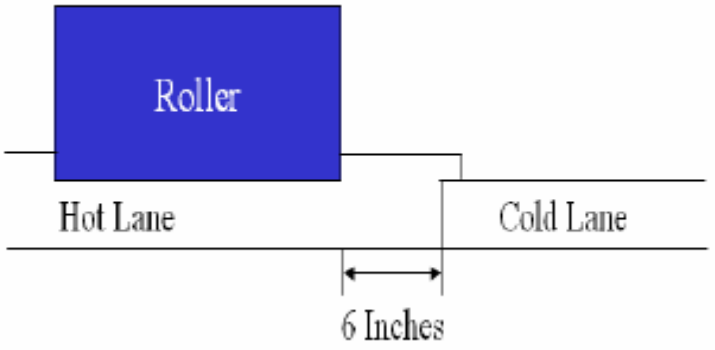
Joint Design Specification

- Eliminate the joint all together (Echelon) if possible
- Tack well 3mm thickness
- Hot side rolling with 150mm offset.
- Vertical offsets between surface and base courses 300mm
- Cut cold joints 8” from pavement edge
- Overlap mats by 20-30mm to weld the joint
- Limit over raking

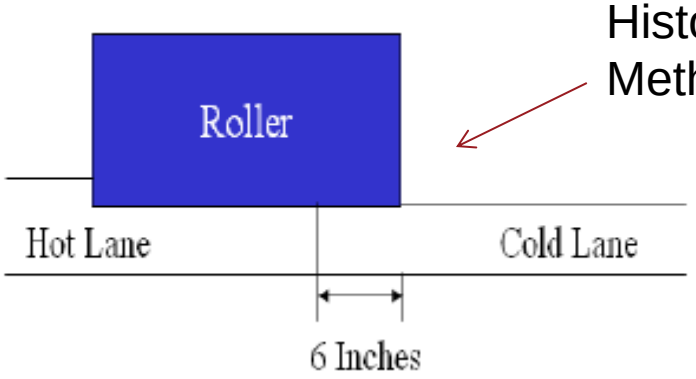
Joint Construction Methods

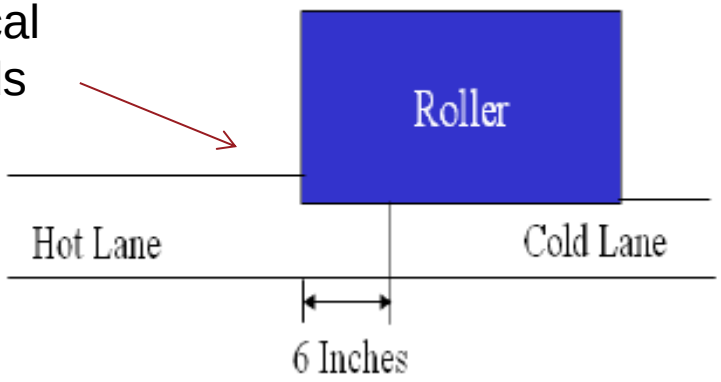
Focus on Rolling

Focus on confining material at the joint and compactive effort.



Historical Methods





Joint Construction Options

Notched Wedge Joint

- Develops an wedge or Step that spreads the joint out, and when matched creates better geometry for consolidation and compaction

Joint Construction Options

Edge Confining Device

- Purpose is to confine material and stop “push out” during rolling.

Joint Construction Options

Cutting Wheel

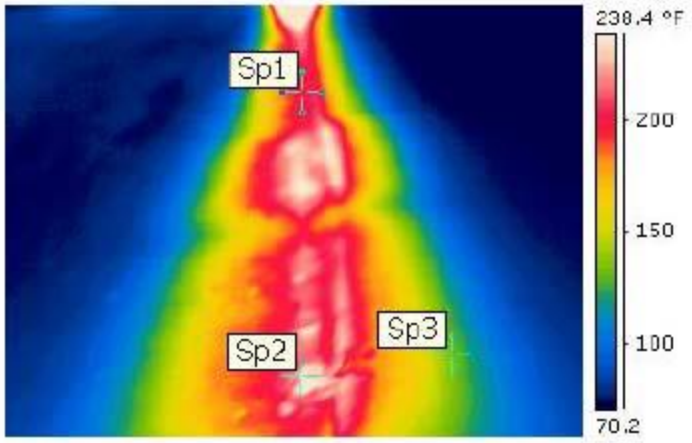
- Use of a cutting wheel can cut a joint immediately after finish rolling to save saw cutting or milling, and allows continuous paving

Joint Construction Options

Rubberized Joint Sealant

- Place a modified compound at that joint that fill pores and openings in the aspahlt making the material very dense and waterproof

Joint Construction Options

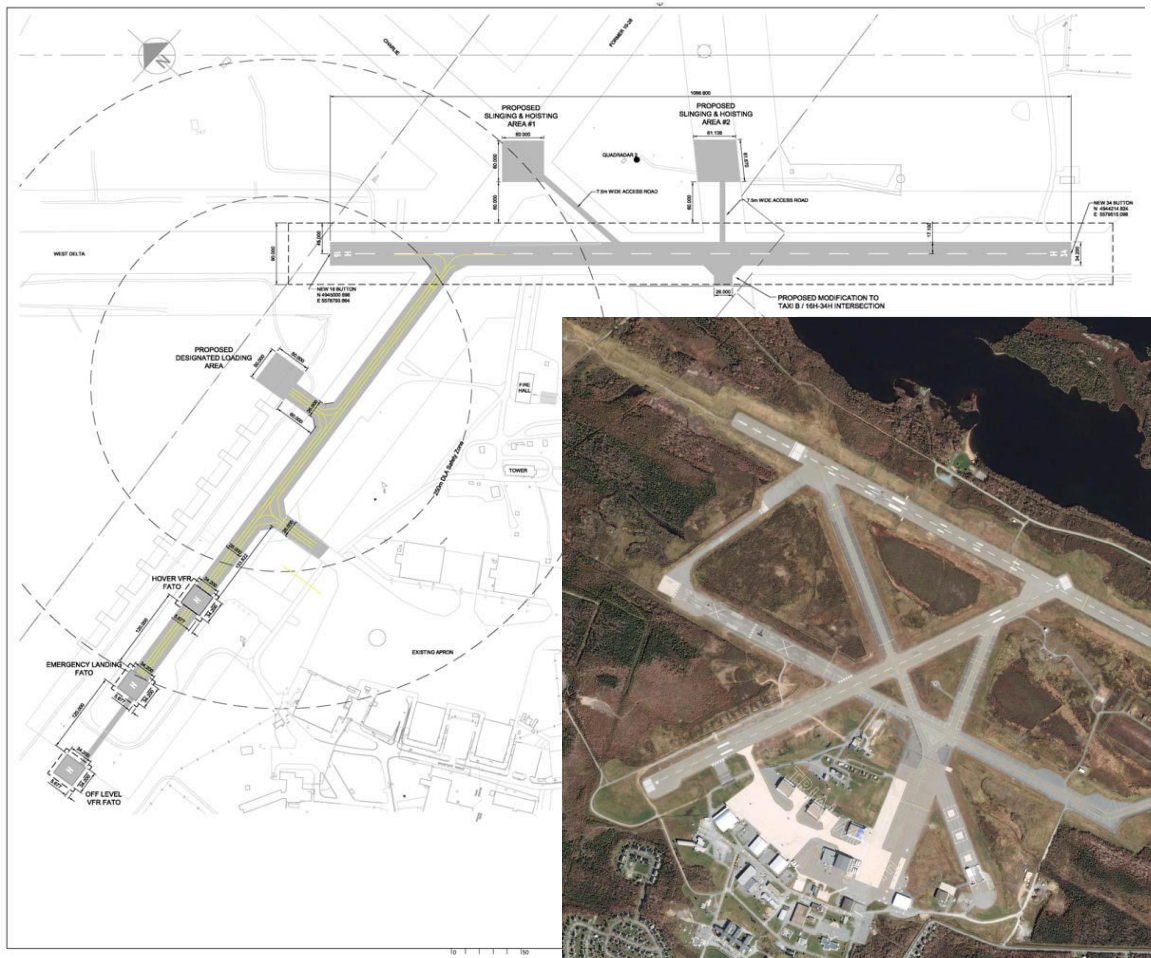


Infrared Heaters

- Reheat material without harming binder
- Makes for seamless surface texture and more uniform joint integrity.
- Can effectively warm cool or cold joints by varying amount of heat and time on joint.

CFB Shearwater Helipad Conv

2007-2008



CFB Shearwater

2007-2008

Specifications

- HMAC specification called for maximum surface tolerances using a 3m straightedge
  - 6mm on the base course, 3mm on the surface course
- Cold joint was defined by a temperature of 80^{o}C or less in the adjoining lane.
- Cold joints had to be cut back by at least 200mm by saw cutting.
- Compaction requirements were 94% mainline & 93% joints
- Cut joint specs below 100^{o}C

CFB Shearwater

2007-2008

Construction Alterations

- Proposed the use of a Infrared Joint Heater.
- DCC accepted variation for “warm”joint upon outside trial.
- Cut joint specs below 100^{o}C
- Joint heater successfully used to raise the temperature of all joints to minimum of 80^{o}C.
- In most cases the joint was increased to 100^{o}C.
- The heater was towed with a small tractor and had little or no impact on other equipment during the paving operation.
- Milled and cut edge at night.

CFB Shearwater

2007-2008

Field Observations

- 20mm heat penetration depth was achieved
- Joint mill speed key to success. Too fast breaks off edge
- Pavers in echelon specified at 30m, plan was 10m, result was around 3m
- Production was 1500 to 2300 tonnes a day
- Shuttle used and even with close spacing and the heater, no confusion resulted.
- Average day they achieved 400 meter strips or 3 per day
- Relative depth of adjoining HMA key . Allow for compaction.
- Heater applied on all strips, then after edges cut at night, tacked and reheated.

CFB Shearwater

2007-2008

The results

- Achieved a Mat Density Base HMA -94.4 Surface 95.1
- Heated Joints -94.1 no failures
- Where only Cut joints used 92.6 and several failures, these were fixed
- Minimal non-conformances were experienced
- The quality of the placed HMAC on this project was considered to be very good, especially considering that paving was done in late October and November.
- The longitudinal joints are all well bonded and tight and the surface tolerances were all within the specified parameters.

Halifax Stanfield International

2004 - 2012

Halifax Stanfield International

2004 - 2012

Logistical Challenges

- Only 2 runways to choose from.. Must remain active at all time
- Displaced thresholds
- Short working windows
- Extremely demanding paving times and fast openings
- Weather – RAIN & FOG

Halifax Stanfield International

2004-2012

Specifications – An Evolving Program

- Transport Canada Specification in 2004
- Adopted NSTIR Gradation and Materials Specifications in 2006.
- Migrated from PG 58-28 to PG 64-28 to 64-28p to combat rutting on taxiways from early post construction openings.
- Adopted and allowed use of joint heaters, notched wedge joint, and pavesmart grade and paver controls.

Halifax Stanfield International

2012 Specification Changes

- Adoption of Superpave Gyratory Compactor
- 75 Gyrations vs 50 Blows (typically highway effort is 100 gyrations and 75 blows/side)
- Included an elastic recovery specification for polymer modified binders vs. polymer content.
- Implementation of High Speed Intertial profiler for measuring smoothness.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